

# **Medicare Quality Monitoring System (MQMS) Report:**

## **Acute Myocardial Infarction (AMI), 1992-2001**

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Opinions and interpretations expressed herein are not necessarily the position of CMS or any other federal agency.



# ABOUT MQMS

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## BACKGROUND

The Medicare Quality Monitoring System (MQMS) is an ongoing system that processes, analyzes, interprets and disseminates health related data to monitor the quality of care delivered to Medicare fee-for-service beneficiaries. The MQMS was initiated to provide useful information to the CMS PROs (Peer Review Organizations, currently renamed as Quality Improvement Organizations) program and has been evolved to address growing public concerns over quality of care, patient safety, provider accountability and patient choice. It is directed by the Centers for Medicare & Medicaid Services (CMS) with assistance from its contractors. MQMS development and production involves a diverse group of CMS staff, including program managers, clinical area team leaders (clinicians), epidemiologists, statisticians, and data analysts in the central and regional offices. CMS also consulted with leading experts in other federal agencies—such as the Agency for Health Care Research and Quality, the Centers for Disease Control—and in quality improvement organizations and academia.

## INTENDED USE OF THE MQMS DATA

The MQMS is designed with the intention to support data-driven decision-making regarding quality improvement and payment/coverage policymaking. Development and production of the 2003 MQMS measures and respective methodologies were primarily aiming at providing input for broad and high-level policy making and program planning within CMS.

The 2003 MQMS **describes** trends, patterns, and variations in health status, disease- and procedure-specific utilization, outcomes and process of care at the national and state level that are related to CMS quality improvement program and initiatives, patient safety and payment/coverage policies. Without further analysis and manipulation of the data, the 2003 MQMS data are **inadequate to explain the specific causes of** the trends, patterns, and variations.

In addition to CMS internal use, MQMS provides data on Medicare quality of care for the AHRQ National Healthcare Quality Report (NHQR) and National Healthcare Disparities Report (NHDR).

- Specifically the MQMS data are to be used for:
  - Identifying potential quality problems
  - Tracking program implementation

- Suggesting project ideas for quality improvement program
  - Targeting interventions
  - Prioritizing activities & allocation of resources
  - Focusing on a particular problem
  - Raising research questions/hypothesis for further investigation
- Further well-deliberated multivariate analysis is required for the MQMS data to be meaningful and useful for:
  - Drawing conclusions on cause-effect association between the QIOs process of care measures with the MQMS outcome measures
  - Evaluating individual QIO, providers in a state or state performance
  - Evaluating directly the effectiveness of the QIO program and other CMS quality improvement initiatives and payment/coverage policies

### **POPULATION AND HEALTH ISSUES EXAMINED**

The population under study consists of Medicare fee-for-service (FFS) beneficiaries. MQMS is limited to FFS beneficiaries because of the current unavailability of encounter data from Medicare managed care plans. The MQMS 2003 edition monitors the following types of quality measures:

- Mortality and readmission rates, length of stay, and cost of hospitalizations for three conditions —acute myocardial infarction (AMI), heart failure and stroke
- Process of care and progression of diseases for diabetes
- Mortality and readmission rates following cancer-related and cardiac-related high-risk surgical procedures
- Patient safety
- Preventable hospitalization

### **METHODS**

The 2003 MQMS analysis is limited to the national and/or state level, presenting longitudinal and/or cross-sectional descriptive statistics for various demographic and geographic subgroups. The results of MQMS 2003 edition are age-sex adjusted and not risk adjusted. The age-sex adjustment eliminates state-to-state and year-to-year variations in the age and sex composition but not the comorbidities or severity of illness of the

population. The age-sex adjusted data preclude interpretation alluding to state or provider performance.

MQMS results are based on data from all fee-for-service beneficiaries and claims, rather than a sample of such beneficiaries and claims. This means that the rates presented in MQMS reports do not contain sampling error. MQMS rates are not presented with confidence intervals or significance testing, since these intervals and tests are based on properties of sampling error. This approach implies that the FFS population is not interpreted as a sample drawn from a super-population, such as all Medicare beneficiaries or FFS beneficiaries from another time period. The one exception is the MQMS diabetes results, which are based on a five percent sample of full-year fee-for-service Medicare beneficiaries. Thus, rates presented in the MQMS diabetes reports are subject to sampling error, and confidence intervals or significance testing are presented.

MQMS results are subject to measurement error in the CMS Denominator File and MedPAR database, as well as to modeling error resulting from the age-sex adjustment. CMS continues to investigate the magnitude of these errors.

## PRODUCTS

The MQMS products are a series of reports on quality measures, a set of tables on CMS' web site, plus the data files at the person and aggregate level used to generate the reports and documentation of the methodology and data processing. The reports are available on the CMS website; the data files and documentation reside on the CMS mainframe. To facilitate the use of the data and replication of the analysis, CMS makes available SAS programs and data processing documentation. Access to the data can be granted to CMS analysts on request. Other federal agencies and CMS contractors may obtain the data through a formal data request process.

MQMS 2003 reports include:

- MQMS Report: Beneficiary Characteristics and Utilization, 1992-2001
- MQMS Report: Acute Myocardial Infarction (AMI), 1992-2001
- MQMS Report: Patient Safety, 2000 and 2001
- MQMS Report: Heart Failure, 1992-2001
- MQMS Report: Preventable Hospitalizations, 1995-2001
- MQMS Report: Stroke, 1992-2001
- MQMS Report: Cancer-Related High-risk Surgeries I, 1992-2001
- MQMS Report: Cardiac-Related High-risk Surgeries II, 1992-2001

- MQMS Report: Diabetes, 1992-2001

## EXECUTIVE SUMMARY

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This report summarizes trends and variation in hospitalization of Medicare beneficiaries for acute myocardial infarction (AMI). The report describes discharge rates, length of stay, cost, readmission and mortality from 1992 to 2001. It tracks the utilization measures for the AMI population as a whole and by demographic subgroup over the study period. Intended as one component of a surveillance effort, the report highlights recent trends and possible changes in trends in the care of AMI patients. It also points to geographic or demographic differences in utilization and mortality of beneficiaries hospitalized for AMI. The report addresses three specific questions:

- What are the characteristics of the Medicare AMI population and how similar is this population to the general Medicare FFS population?
- What are the trends and variation in hospitalization for AMI in the Medicare FFS population and how do these trends differ by region and demographic group?
- What are the trends and variation in readmission and mortality after AMI hospitalization over varying time periods after initial discharge?

### **Characteristics of the AMI Population**

- The AMI population was predominantly white (88 percent), aged (90 percent), and urban (71 percent). Males constitute 51 percent and dual eligibles 19 percent of the AMI population. Thirty-nine percent lived in the South and 56 percent were between the ages of 70 and 84.
- The AMI population was older than the overall FFS population and more likely to be male. Males were 51 percent of the AMI population in 2001, while they were 44 percent of the FFS Medicare population. The over-80 population was 40 percent of the AMI population but only 24 percent of the FFS population.
- The racial distributions of the AMI and overall FFS populations were similar. The AMI population was less likely to live in urban areas and in the West than the overall FFS population.
- AMI beneficiaries were slightly more likely to be dual-enrolled as indicated by the presence of a state Medicaid buy-in. They were more likely to be qualified for Medicare under the end-stage renal disease (ESRD) benefit, but were less likely to be qualified as disabled, compared to the overall population.

**Hospitalization, Length of Stay, and Expenditure for AMI**

- Rates of hospital discharges for AMI increased slightly between 1992 and 2001. The age-sex adjusted rate of hospitalization for AMI increased by 8 percent between 1992 and 2001, from 9.0 per 1,000 beneficiaries to 9.7 per 1,000 beneficiaries.
- Medicare payment per AMI discharge increased by 41 percent, from \$8,664 to \$12,223 over the same period. Inflation-adjusted total Medicare payments for AMI hospitalizations remained roughly constant from 1992 to 2001.
- Although the rate of hospital discharge for AMI was greater for whites than for blacks, discharge rates increased more rapidly for blacks than for whites, particularly after 1995. While discharge rates for whites increased by 6 percent over the period, they increased by 29 percent for blacks.
- The increase in hospitalization for AMI was most apparent for beneficiaries age 80 and over. The rate of hospital discharge for AMI was virtually unchanged between 1992 and 2001 for beneficiaries under the age of 80. Older beneficiaries, however, were much more likely to be hospitalized for AMI in 2001 than in 1992. For example, the discharge rate for beneficiaries aged 70-74 was unchanged at about 8.4 per 1,000; for those aged 85-89, the rate increased from 14 per 1,000 to 19 per 1,000.
- Both the level and change in AMI discharge rates varied widely; 4 states showed increases of 20 percent or more; 15 states showed decreases. State-level discharge rates in 2001 ranged from 6.3 per 1,000 beneficiaries to 13.3 per 1,000.

**Hospital Readmission Among AMI Beneficiaries**

- The rate of hospital readmission for AMI within 30 days of discharge for AMI was nearly unchanged from 1992 to 2000, but fell from 37.3 to 33.5 per 1,000 between 2000 and 2001.
- The rate of all-cause readmission within 30 days of AMI hospitalization increased by 6 percent from 233 per 1,000 to 246 per 1,000 between 1992 and 2001.
- AMI readmission rates rose among blacks and fell for whites between 1992 and 2001. In 1992, 30-day AMI readmission rates were similar for blacks and whites—34 per 1,000 for blacks and 38 per 1,000 for whites. By 2001, the rate had fallen by 13 percent for whites, but increased by 17 percent for blacks.

### **Mortality Among AMI Beneficiaries**

- In 2000, 152 of every 1,000 beneficiaries hospitalized for AMI died within 30 days of admission; 293 per 1,000 died within one year of admission.
- Mortality following AMI hospitalization declined between 1992 and 2001, particularly when measured over periods of 30 days or less after discharge. Mortality within 30 days of AMI admission fell from 189 per 1,000 in 1992 to 148 per 1,000 in 2001.
- Long-term mortality declined between 1992 and 1997 and then leveled off. One-year mortality fell from 320 per 1,000 in 1992 to 293 per 1,000 in 1997. In 2000, the rate was again 293 per 1,000.
- By 2000, four states exhibited one-year AMI mortality rates of less than 280 per 1,000. Two states had one-year AMI mortality rates exceeding 360 per 1,000.



# **MEDICARE QUALITY MONITORING SYSTEM (MQMS) REPORT:**

## **ACUTE MYOCARDIAL INFARCTION (AMI), 1992-2001**

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### **I. INTRODUCTION**

Cardiovascular disease accounts for more deaths in the United States than any other single cause. Each year, approximately 1.1 million people experience an acute myocardial infarction (AMI), or heart attack. Almost two-thirds of heart attack patients do not make a complete recovery; moreover, those who survive the acute phase have a chance of related illness and death that is two to nine times higher than that of the general population. One-third of those suffering an AMI die during the acute phase. Over 80 percent of all heart attack-related deaths occur in individuals age 65 or older. The average age of first heart attack is 66 for men and 70 for women (American Heart Association 1998; 2002).

This report uses data from the Medicare Quality Monitoring System (MQMS) to study trends and variations in AMI discharges, readmissions, and mortality among Medicare fee-for-service beneficiaries from 1992 through 2001. Later MQMS reports will provide information on the other four Clinical Priority Areas in the Health Care Quality Improvement Project (HCQIP): heart failure, diabetes, pneumonia, and stroke. During the 1990s, CMS increased its efforts to improve the quality of care for beneficiaries hospitalized with these conditions. In 1999, CMS began evaluating the Quality Improvement Organizations (QIOs) on quality indicators for each condition.<sup>1</sup> CMS chose these diagnoses because they are common in the Medicare population and because effective interventions have been shown to reduce disability and mortality. All five are projects under the Sixth Scope of Work for Medicare QIOs.

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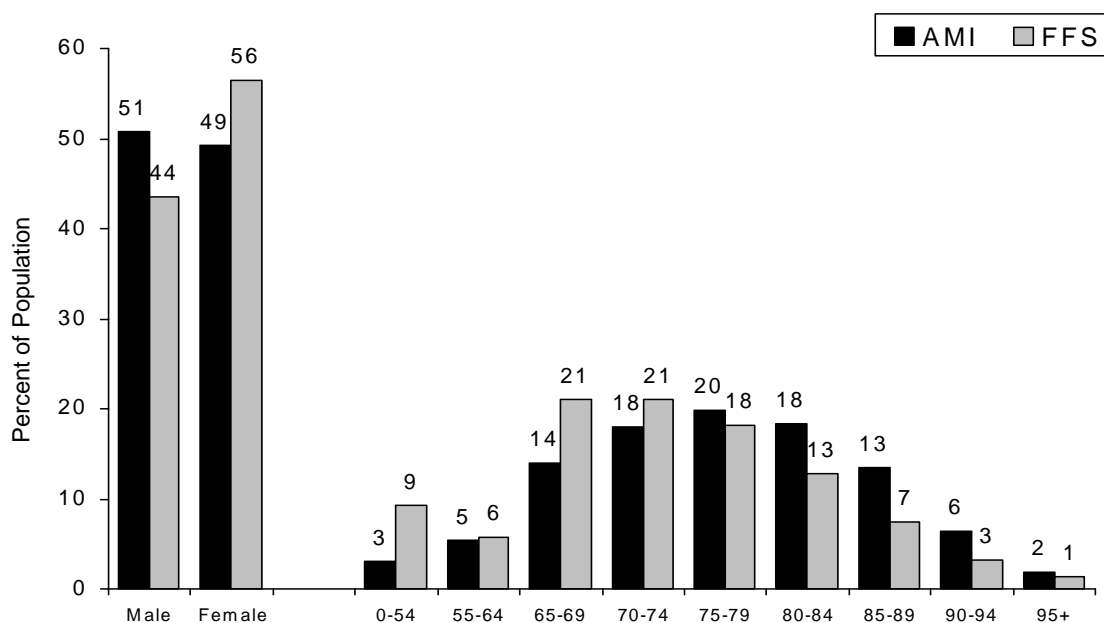
<sup>1</sup> The quality indicators for AMI are (1) early administration of aspirin, (2) early administration of beta-blocker, (3) timely reperfusion, (4) aspirin at discharge, (5) beta-blocker at discharge, (6) ACE inhibitor at discharge for patients with low left ventricular ejection fraction, and (7) smoking cessation counseling during hospitalization.

Appendix A contains a detailed description of the data sources, sample selection, and variable construction for each outcome measure used in this report. Appendix B provides supporting tables for each outcome, offering greater detail by demographic groups, state, and region than is presented in the body of the text.

## II. CHARACTERISTICS OF THE FEE-FOR-SERVICE AMI POPULATION

Over 300,000 Medicare full-year FFS beneficiaries were hospitalized for at least one heart attack in 2001. These beneficiaries—hereafter referred to as the AMI population—represented just under one percent of the overall Medicare FFS population of 31.5 million. Appendix Table B.3 presents a comparison of the AMI population with the overall FFS population in 1992 and 2001.<sup>2</sup>

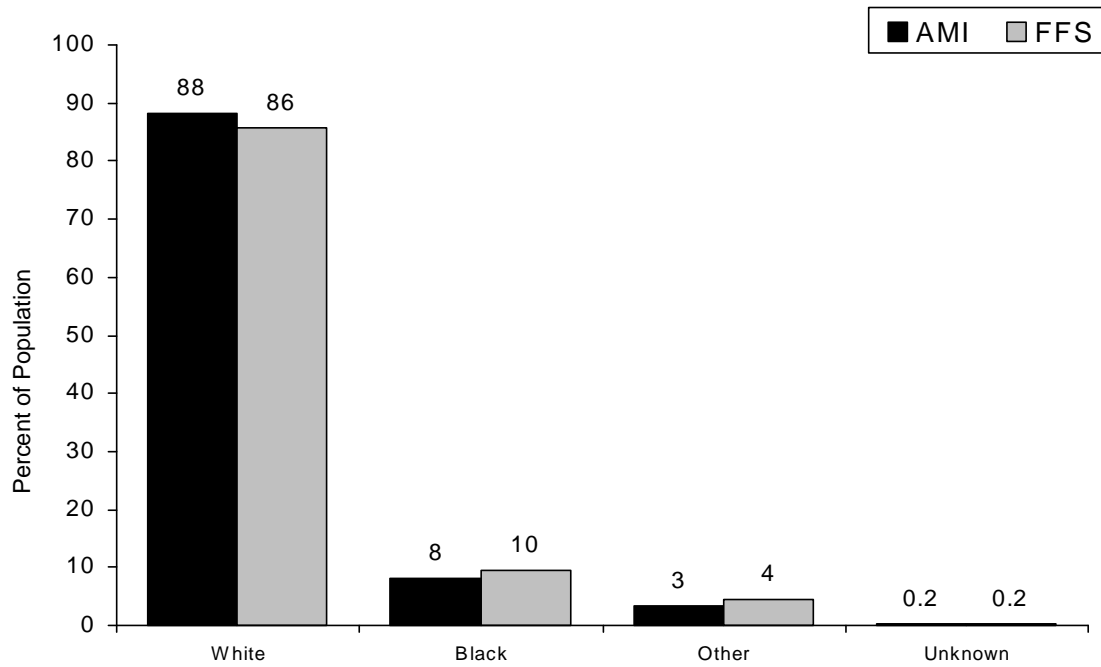
**Figure II.1. FFS AMI Population and the Entire Medicare Population, by Sex and Age Group, 2001**



- The most noticeable differences in the AMI population compared to the overall FFS population is that they are older and more likely to be male. Males were 51 percent of the AMI population in 2001, while they were 44 percent of the overall population. Persons aged 80 and over represented 39 percent of the AMI population but only 24 percent of the overall FFS population.

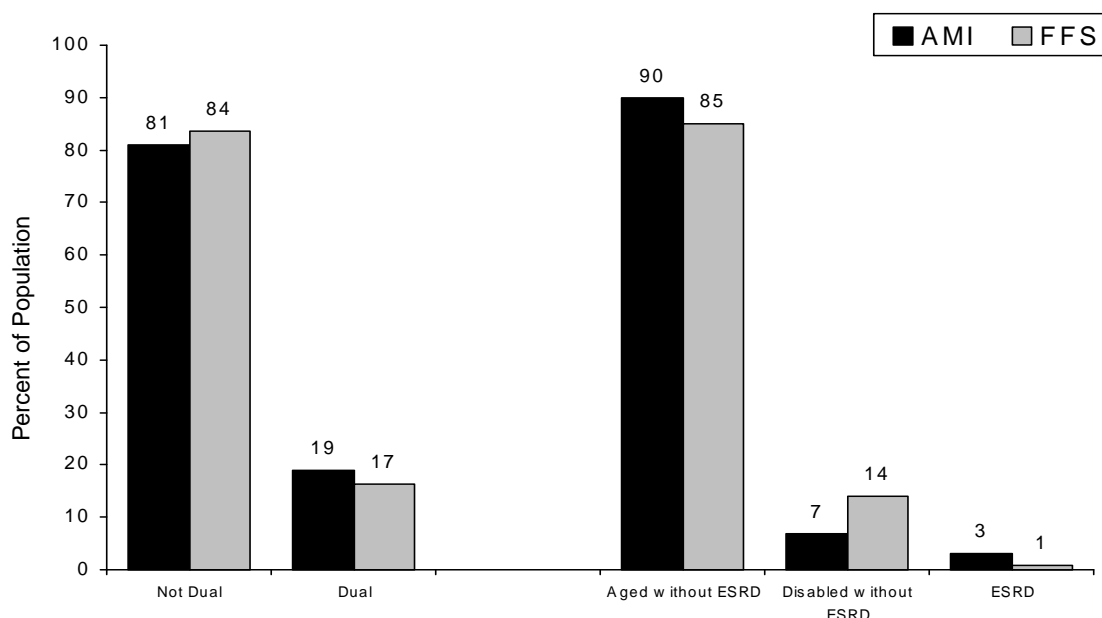
<sup>2</sup> This report uses the HCQIP definition of AMI.

**Figure II.2. FFS AMI Population and the Entire Medicare Population, by Race, 2001**



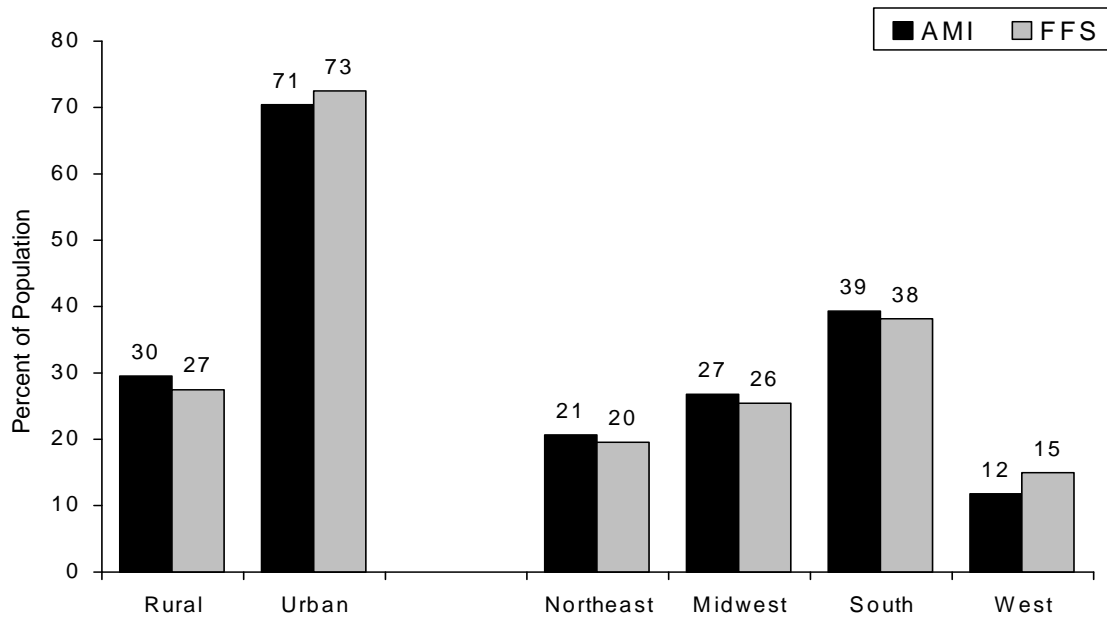
- The racial distributions of the AMI population and the overall FFS population were similar. The overall FFS population was 86 percent white and 10 percent black; the AMI population was 88 percent white and 8 percent black.

**Figure II.3. FFS AMI Population and the Entire Medicare Population, by Medicaid Buy-In and Medicare Eligibility Status, 2001**



- The AMI population was slightly more likely to be dually enrolled in Medicare and Medicaid than was the general FFS population. In 2001, 19 percent of the AMI population was dually enrolled, compared to 17 percent of the FFS population.
- The proportion of beneficiaries that were dually enrolled increased by about 6 percentage points for both the AMI and FFS populations between 1992 and 2001 from 12.8 to 18.9 percent (see Appendix Table B.3).
- The AMI population is more likely than the FFS population to receive care under the Medicare ESRD benefit. Three percent of the AMI population were entitled to Medicare as a result of ESRD, compared to one percent of the FFS population.
- Seven percent of the AMI population qualified as Disabled without ESRD, compared to 14 percent of the entire FFS population.

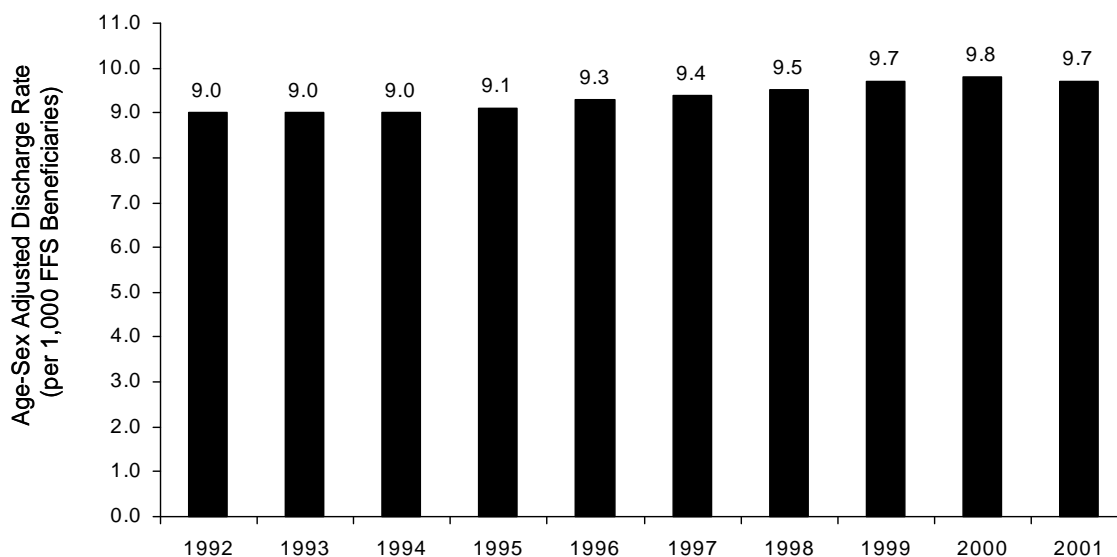
**Figure II.4. FFS AMI Population and the Entire Medicare Population, by Urban/Rural Status and Census Region, 2001**



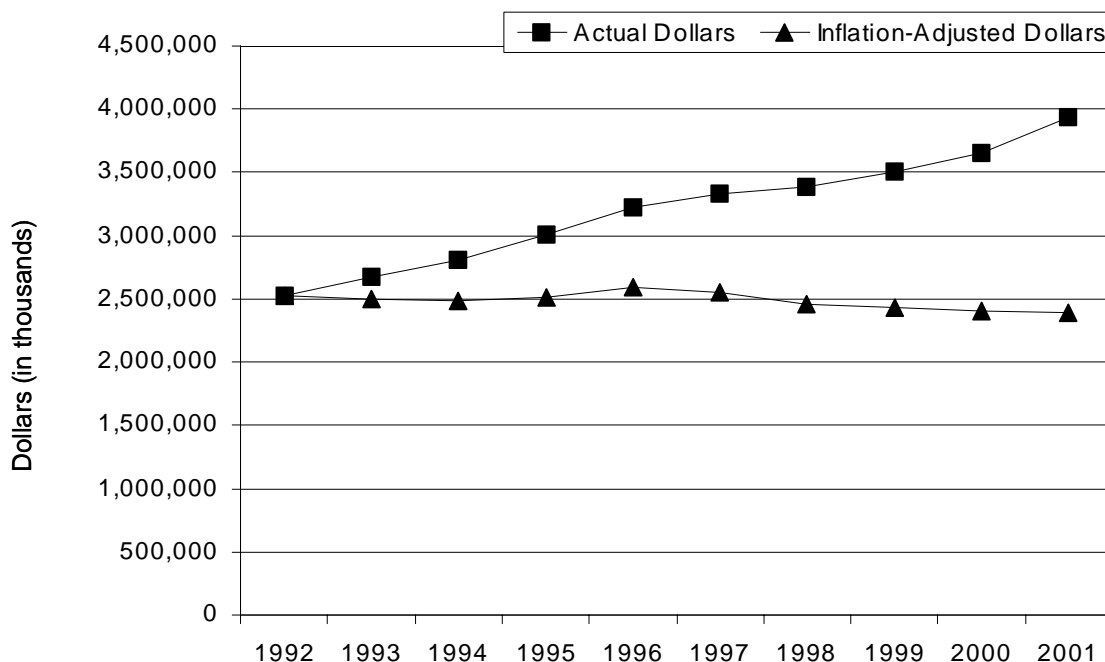
- Thirty percent of the AMI population and 27 percent of the FFS population lived in rural areas in 2001.
- The proportions of the AMI and FFS populations residing in the Northeast, Midwest, and South were nearly identical in 2001. But only 12 percent of the AMI population lived in the West compared to 15 percent of the overall FFS population.

### III. HOSPITALIZATION FOR AMI: RATES, EXPENDITURE, AND LENGTH OF STAY

Figure III.1. Trends in Medicare AMI Hospital Discharge Rates, 1992-2001



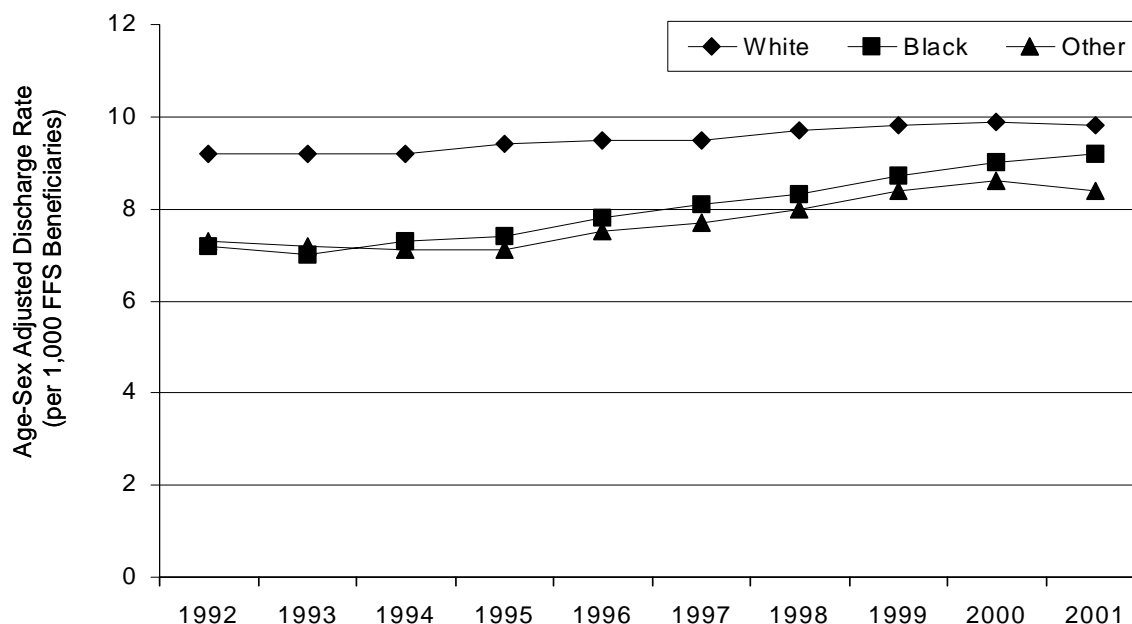
- Rates of hospital discharges for AMI increased slightly between 1992 and 2001. The age-sex adjusted rate of hospitalization for AMI increased by 8 percent between 1992 and 2001, from 9.0 per 1,000 beneficiaries to 9.7 per 1,000 beneficiaries. (Figure III.1)
- The annual increase in the AMI discharge rate (computed from Appendix Table B.4) was slightly higher between 1997 and 2000 (1.39 percent per year) than between 1992 and 1997 (0.87 percent per year).
- The proportion of individual beneficiaries discharged for AMI increased over the period as well, from 8.5 beneficiaries discharged per 1,000 FFS beneficiaries in 1992 to 9.1 per 1,000 in 2001 (Appendix Table B.5).
- The mean number of AMI discharges per beneficiary with any AMI discharges was virtually unchanged during the period, rising from 1.06 in 1992 to 1.07 in 2001 (Appendix Table B.10).

**Figure III.2. Total Medicare Payments for AMI Hospitalizations, 1992-2001**

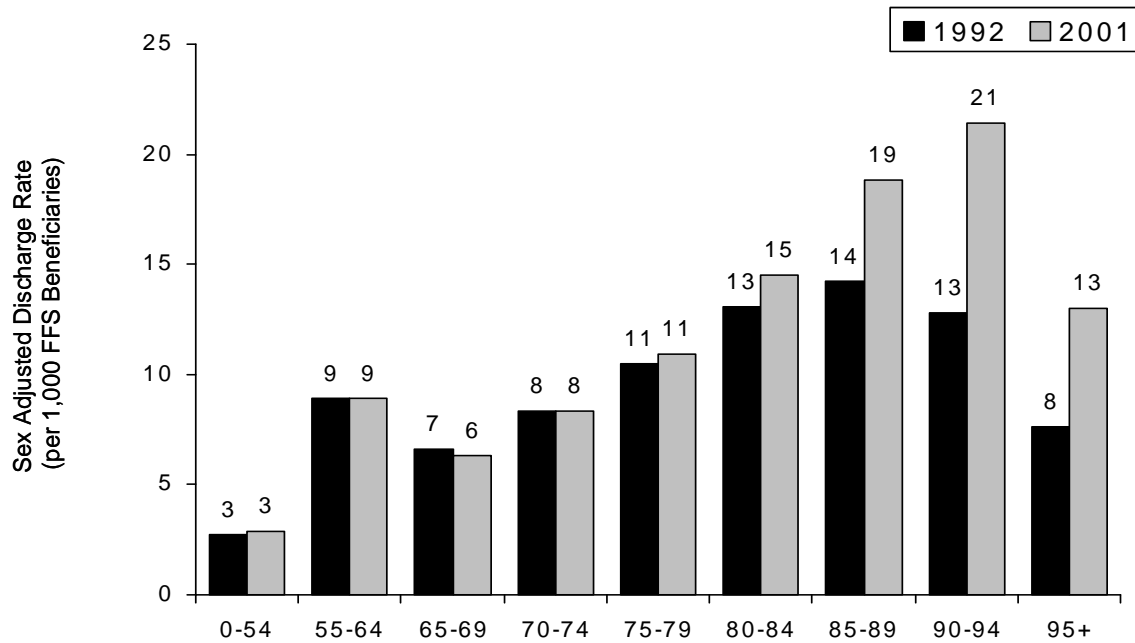
Note: Dollars are adjusted using the Bureau of Economic Analysis' personal consumption expenditure index for medical services, and are expressed in 1992 dollars

- Medicare payments for all AMI hospitalizations increased by 56 percent, from \$2.52 billion in 1992 to \$3.93 billion in 2001 (Figure III.2).
- Medicare payment per AMI discharge (see Appendix Table B.8) increased by 41 percent, from \$8,664 to \$12,223 over the same period.
- The increase in Medicare payment per discharge was somewhat more rapid for AMI hospitalizations than for Medicare hospital discharges in general. The average Medicare payment per discharge for AMI hospitalizations (again see Table B.8) increased by 24.6 percent between 1993 and 1998. During the same period, the mean payment for all acute-care Medicare hospital stays increased by 20.6 percent (Health Care Financing Review 1995; 2000, Table 26).
- Inflation-adjusted Medicare payments for AMI hospitalizations declined slightly between 1992 and 2001. In terms of 1992 dollars, payments fell from \$2.52 billion to \$2.39 billion.

Figure III.3. AMI Discharge Rate, by Race, 1992-2001

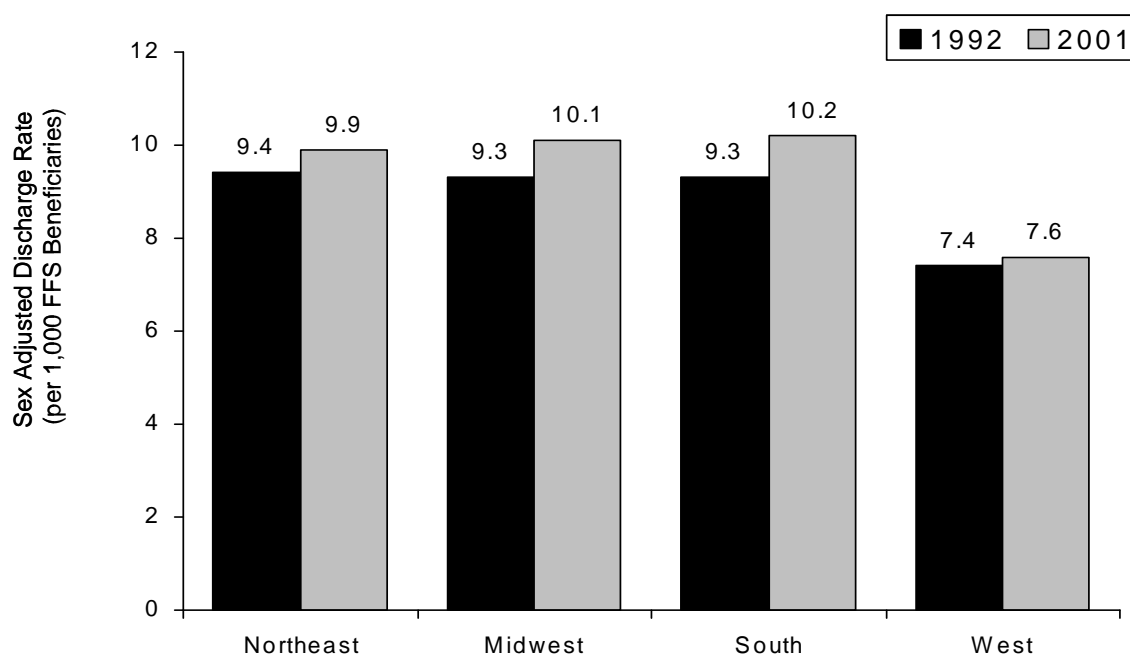


- Although the rate of hospital discharge for AMI was greater for whites than for blacks, discharge rates increased more rapidly for blacks. The rate of increase in hospital discharge for AMI was much more rapid for blacks than for whites, particularly after 1995 (Figure III.3). While discharge rates for whites increased by 6 percent (from 9.2 per 1,000 to 9.8 per 1,000) over the period, they increased by 29 percent (from 7.2 per 1,000 to 9.2 per 1,000) for blacks.
- By 2001, the rate of hospital discharge for AMI among blacks, which was 78 percent of the rate for whites in 1992, had nearly converged with that of whites at 94 percent of the white discharge rate (Source: Appendix Table B.4.).
- The annual rate of increase in the discharge rate (computed using Appendix Table B.4) was more rapid for blacks in the second half of the period (2.4 percent per year from 1992 through 1997 versus 3.2 percent per year from 1997 through 2001).

**Figure III.4. AMI Discharge Rate, by Age Group, 1992 and 2001**

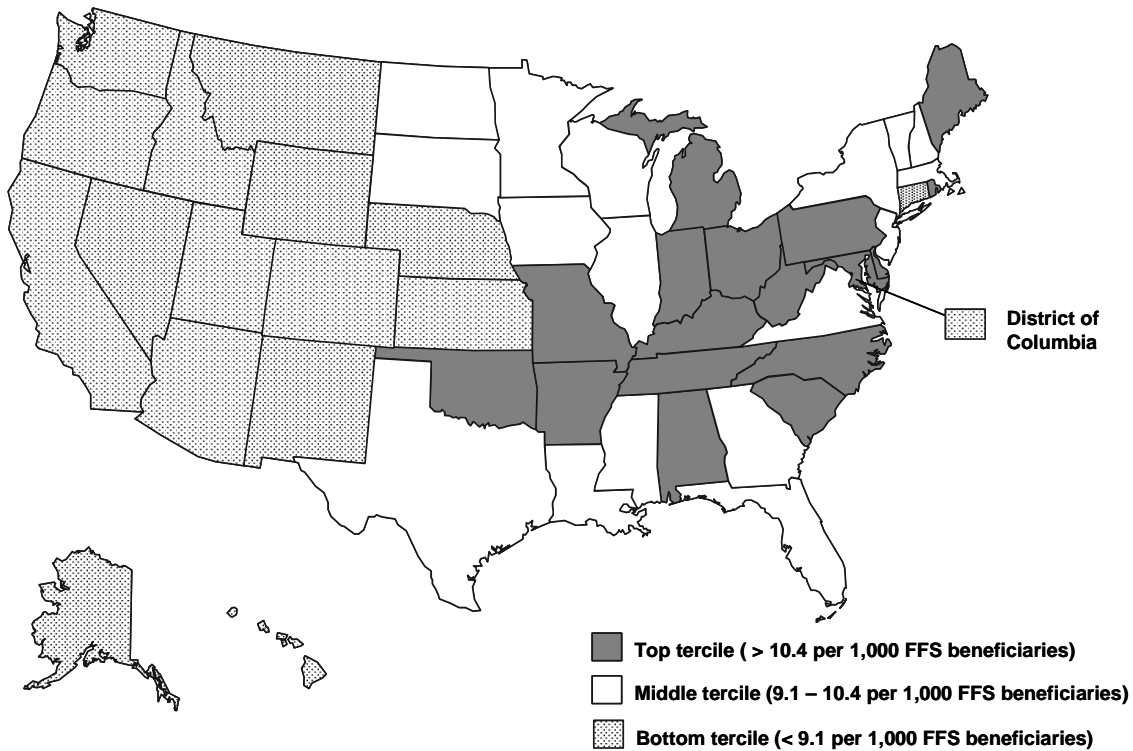
- The increase in hospitalization for AMI was most apparent for beneficiaries age 80 and over. The rate of hospital discharge for AMI (Figure III.4) was virtually unchanged between 1992 and 2001 for beneficiaries under the age of 80. Older beneficiaries, however, were much more likely to be hospitalized for AMI in 2001 than in 1992. The rate of AMI hospitalization for beneficiaries aged 80-84, for example, was 14 per 1,000 in 1992 and 19 per 1,000 in 2001. The proportional increase in hospitalization rose with each succeeding age group (see also Appendix Tables B.4 and B.5).
- The increase in hospitalization among those over 80 years of age appears to have accelerated over the period. The average annual rate of increase in AMI discharge rates (computed using Appendix Table B.4) was greater between 1997 and 2001 than between 1992 and 1997 for each one of the four age categories of beneficiary age 80 and over.
- The AMI discharge rate is greater in the 55-64 age group (9 per 1,000 in 2001) than in the 65-69 and the 70-74 age groups (6 and 8 per 1,000 respectively in 2001). This is probably due to the generally poor health status of the Medicare disabled population compared to the younger age categories in the Medicare aged population.

**Figure III.5. AMI Discharge Rate, by Census Region, 1992 and 2001**



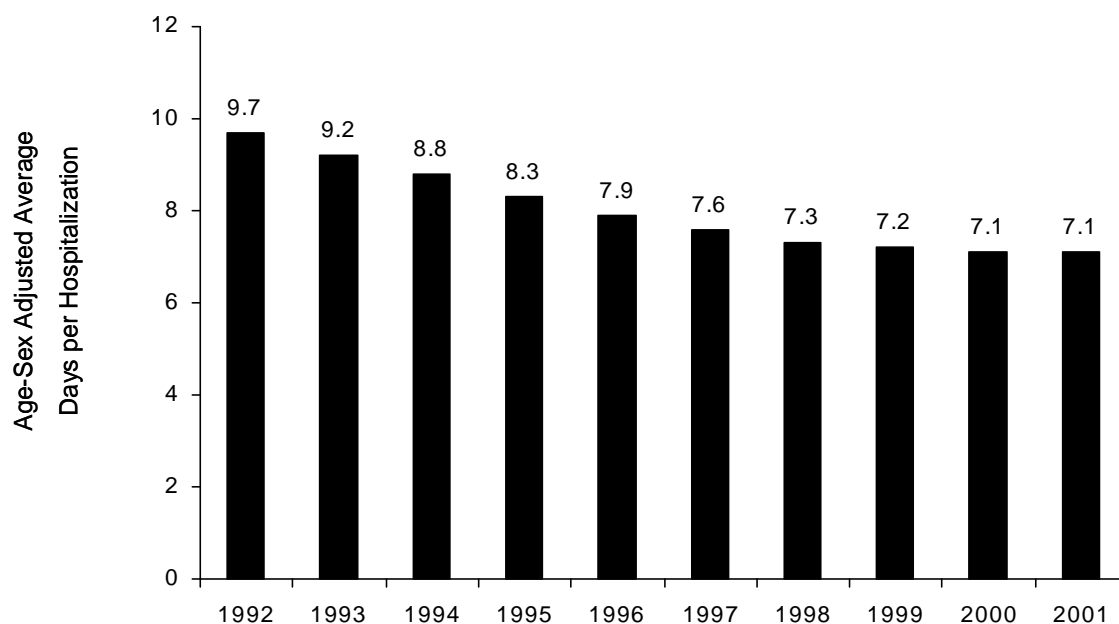
- AMI discharge rates were uniformly lower in the Western United States than in the rest of the country. Although the rate of hospital discharge for AMI increased in each of the four census regions, the age-sex-adjusted rate of discharge was markedly lower in the West than in other parts of the country (Figure III.5). In 2001, AMI discharge rates were 9.9 per 1,000 in the Northeast, 10.1 per 1,000 in the Midwest, 10.2 per 1,000 in the South, and 7.6 per 1,000 in the West.
- Not only were age-sex-adjusted AMI discharge rates 20 percent lower in the West than in other regions of the country in 1992 but that the rate of growth in those discharge rates was also much lower in the West than elsewhere. AMI discharge rates increased by 6 percent in the Northeast, 9 percent in the Midwest and South, but only 3 percent in the West (Appendix Table B.4).

**Figure III.6. AMI Age-Sex Adjusted Discharge Rates, by State, 2001**



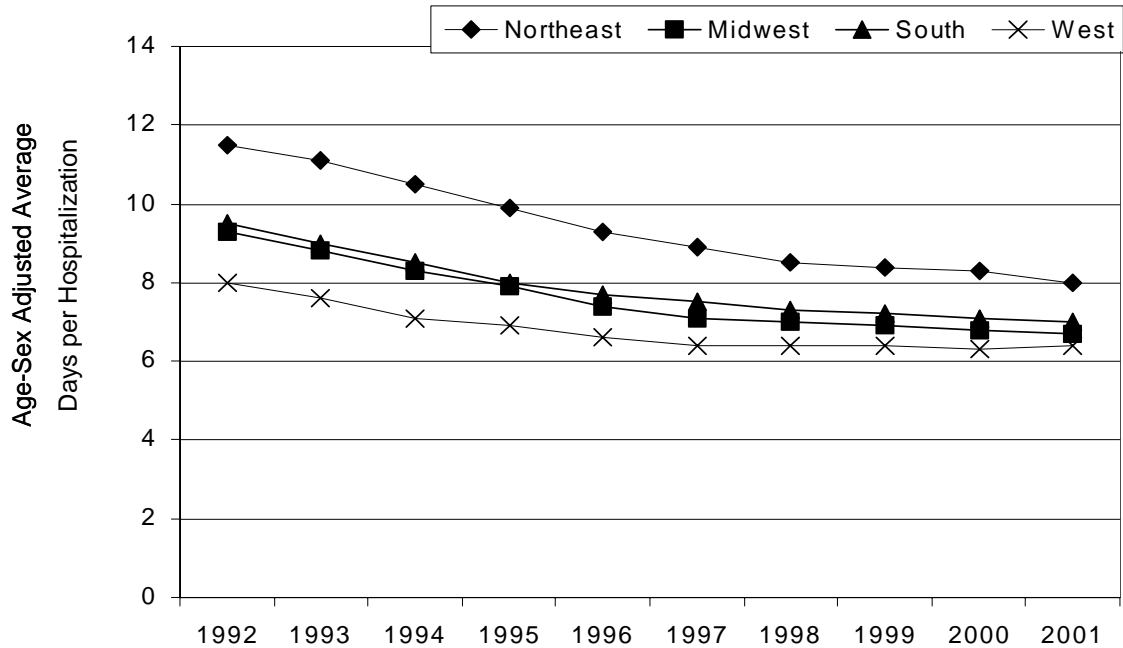
- State-level discharge rates ranged from 6.3 per 1,000 beneficiaries to 13.3 per 1,000 in 2001 (Figure III.6). Both the level and change in AMI discharge rates varied widely; 4 states showed increases of 20 percent or more; 15 states showed decreases (Appendix Table B.4).
- Age-sex adjusted AMI discharge rates increased most rapidly in Indiana, Kentucky, Michigan, South Carolina, and Washington, DC (Appendix Table B.4).
- Discharges declined during the period in Alaska, Arizona, Idaho, Iowa, Kansas, Massachusetts, Nebraska, Nevada, New Hampshire, North Carolina, Rhode Island, South Dakota, Utah, Washington, and Wyoming (Appendix Table B.4).

**Figure III.7. Average Length of Stay for AMI Hospitalizations, 1992-2001**



- Average length of stay for AMI declined steadily between 1992 and 2001. In 2001, the average hospital stay for AMI was 7.1 days—2.6 days shorter than the average in 1992 (see Figure III.7).
- The sharpest declines occurred from 1992 to 1995, when stays fell by nearly half a day per year (see Appendix Table B.6). The length of the average hospital stay continued to fall from 1995 through 2001, though more slowly, by 0.2 day per year.
- The overall reduction is comparable to that for Medicare hospital stays in general. Between 1993 and 1998, the average length of a Medicare acute-care stay fell by 27 percent from 8.0 to 6.1 days (Medicare Statistical Supplement 1995; 2000). During those same years, the average Medicare AMI stay fell by 23 percent (Table B.6).

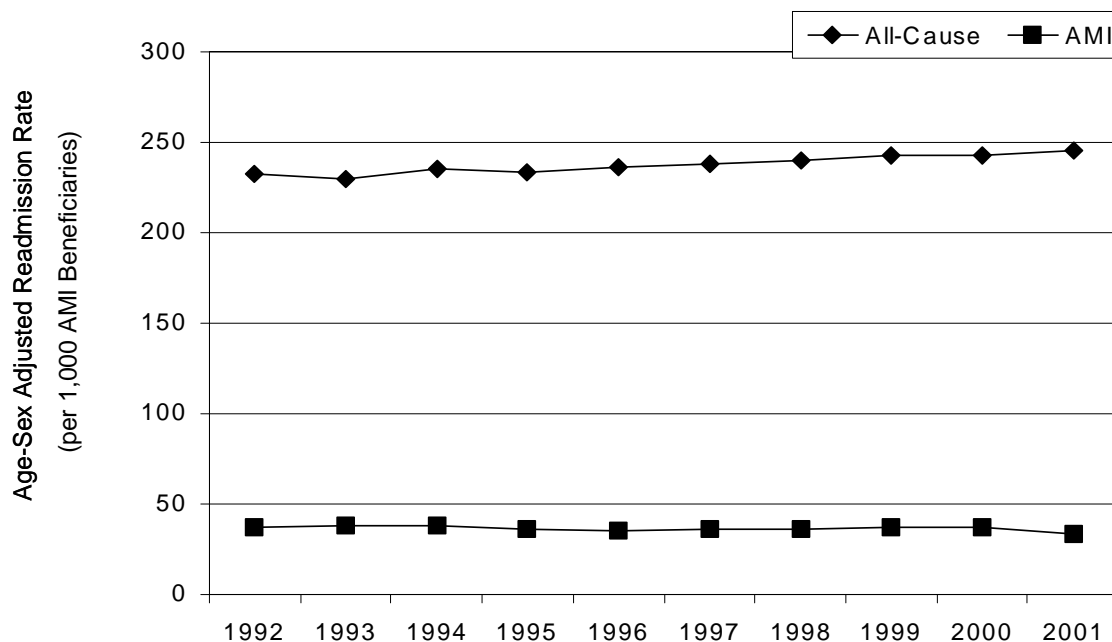
**Figure III.8. Average Length of Stay for AMI Hospitalizations, by Census Region, 1992-2001**



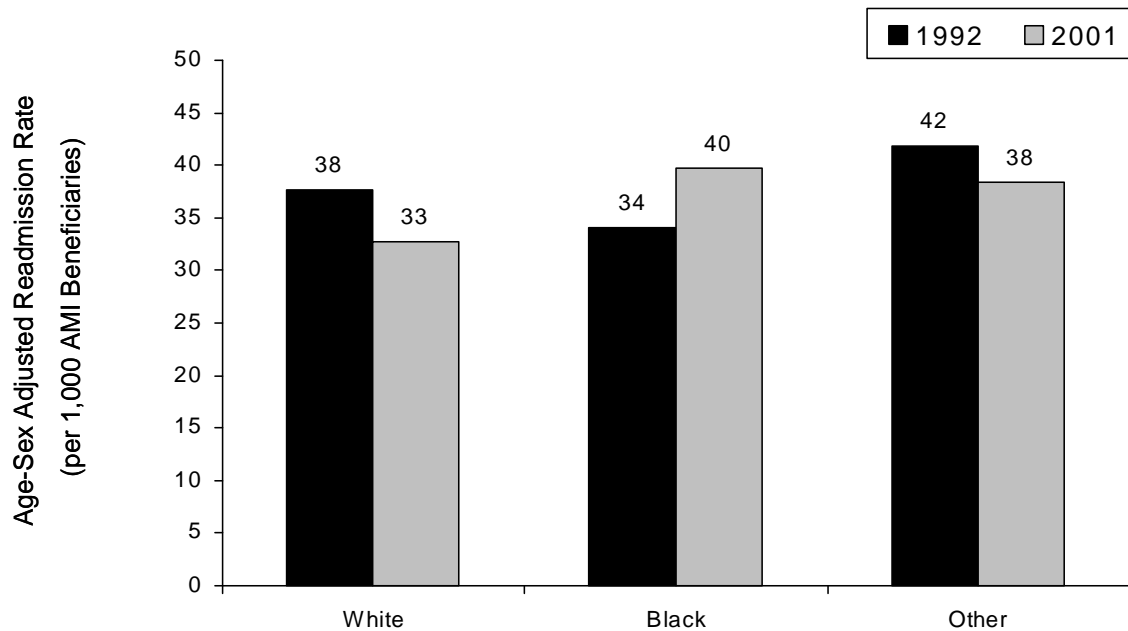
- Average length of stay declined most sharply in the Northeast, from 11.5 days in 1992 to 8 days in 2001 (Figure III.8).
- Average length of stay fell most slowly in the West, from 8.0 days to 6.4 days. Nevertheless, average length of stay was lower in the West in 2001 than in any other region.

#### IV. READMISSION AFTER AMI HOSPITALIZATION

Figure IV.1. 30-Day All-Cause and AMI Readmission Rates, 1992-2001



- The rate of hospital readmission for AMI within 30 days of discharge for AMI was nearly unchanged from 1992 (37.5 per 1,000) to 2000 (37.3 per 1,000) but fell to 33.5 per 1,000 in 2001 (Figure IV.1).
- Very short-term readmission rates fell even more sharply. Two- and seven-day readmission rates decreased by 42 and 26 percent, respectively (Appendix Table B.13).
- Long-term AMI readmission rates, by contrast, increased over the period. The 365-day readmission rate increased by 7 percent over the period, from 119 per 1,000 in 1992 to 128 per 1,000 in 2000 (Appendix Table B.13).
- The rate of all-cause readmission within 30 days of AMI hospitalization increased by 6 percent from 233 per 1,000 in 1992 to 246 per 1,000 in 2001. The increase in 365-day readmissions from all causes was lower, rising by 2 percent from 602 per 1,000 in 1992 to 615 per 1,000 in 2001 (Appendix Table B.12).
- The mean number of hospital discharges (for any cause) per beneficiary hospitalized for AMI increased by 10 percent from 1.8 in 1992 to 2.0 in 2001 (Appendix Table B.11).

**Figure IV.2. 30-Day AMI Readmission Rates, by Race, 1992-2001**

- AMI readmission rates trended in opposite directions for blacks and whites. In 1992, 30-day AMI readmission rates were nearly identical for blacks and whites—34 per 1,000 for blacks and 38 per 1,000 for whites. By 2001, the rate had fallen to 33 per 1,000 for whites, but grew to 40 per 1,000 for blacks (Figure IV.2).
- Seven-day readmission rates fell by 28 percent for whites and increased by 10 percent for blacks; 365-day readmission rates increased by 5 percent for whites and by 26 percent for blacks (see Appendix Table B.13).

**Table IV.1. State Variation in 30-Day AMI Readmission Rates**

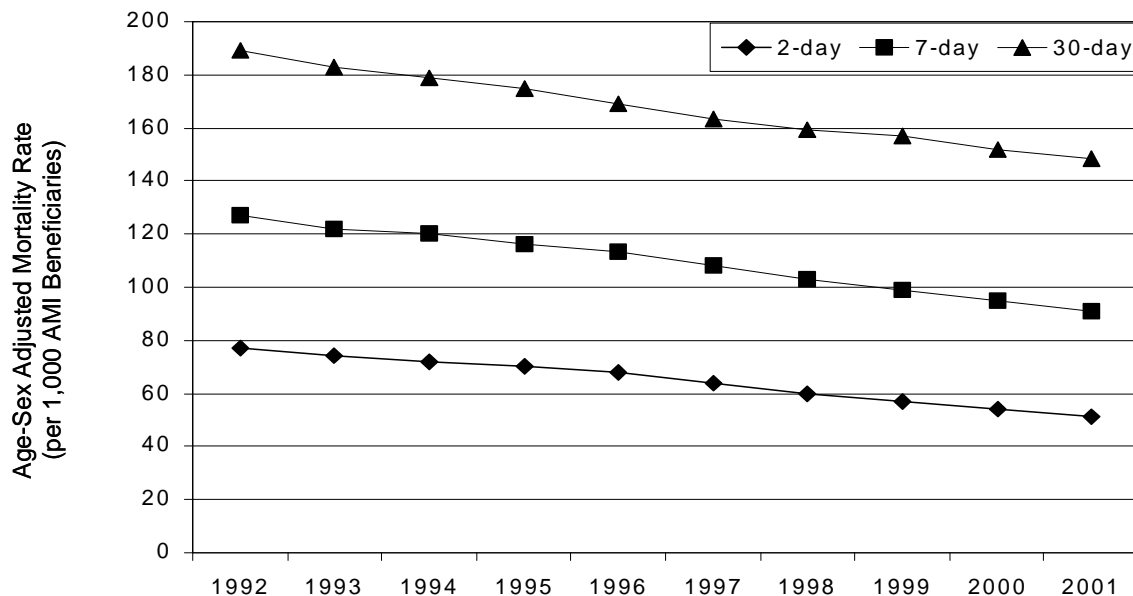
	Age-Sex Adjusted 30-Day AMI Readmission Rates per 1,000 Beneficiaries Discharged with AMI*		
	1992	1996	2001
Minimum	23.1	23.4	21.3
25 <sup>th</sup> percentile	34.6	32.4	30.9
Median	38.7	35.5	34.0
75 <sup>th</sup> percentile	43.1	38.8	37.6
Maximum	72.7	79.2	77.6

\* 7 states were excluded from this analysis due to small sample size

- State-level AMI readmission rates decreased from 1992 to 2001. The median state-level readmission rate decreased by twelve percent from 39 per 1,000 to 34 per 1,000.
- Cross-state variability in AMI readmission was roughly constant over the period. The proportional discrepancy between the 25<sup>th</sup> and the 75<sup>th</sup> percentiles of the distribution of readmission rates was about 10 percent in 1992 and 9 percent in 2001.

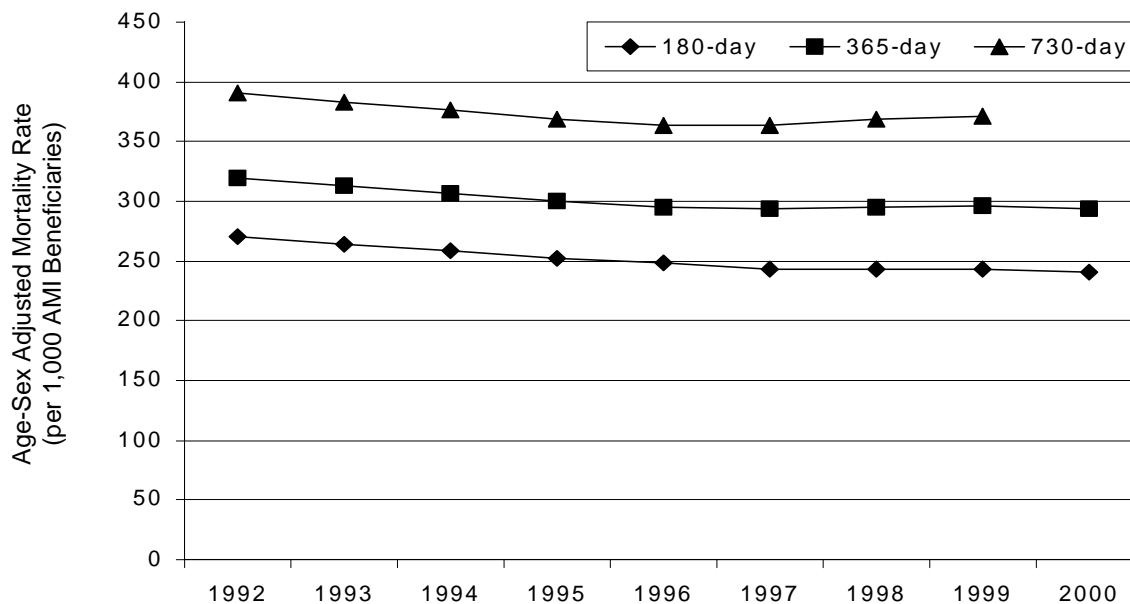
## V. MORTALITY AFTER AMI HOSPITALIZATION

**Figure V.1. Short-term Mortality Rates Among Beneficiaries Admitted With AMI, by Days from Admission, 1992-2001**

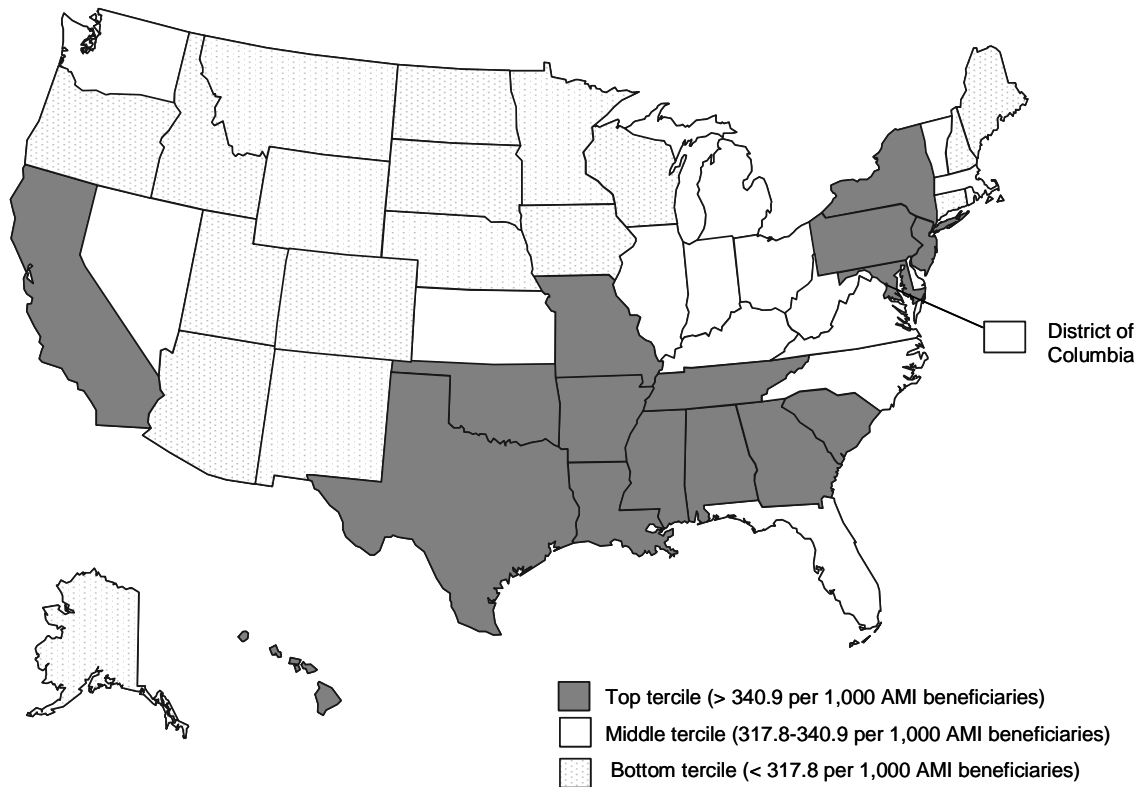


- Mortality within 30 days or less after AMI hospitalization declined between 1992 and 2001 (Figure V.1). In 2001, 148 of every 1,000 beneficiaries hospitalized for AMI died within 30 days of admission, compared to 189 per 1,000 in 1992.
- The 30-day mortality rate in 2001 was 146 per 1,000 for males and 151 per 1,000 for females. Mortality was highest in the South (154 per 1,000 in 2001) and lowest in the Northeast (139 per 1,000 in 2001) (See Appendix Table B.16.). Mortality within two days of admission fell from 77 per 1,000 in 1992 to 51 per 1,000 in 2001.

**Figure V.2. Long-term Mortality Rates Among Beneficiaries Admitted With AMI, by Days from Admission, 1992-2000**



- Long-term mortality declined between 1992 and 1997 and then leveled off (Figure V.2). In 2000, the one-year mortality rate for AMI patients stood at 293 per 1,000 after declining by 8 percent from 320 per 1,000 in 1992. This decline took place entirely between 1992 and 1997, with no further decrease in mortality after the latter year. In fact a slight upward trend may be discerned in 730-day mortality after 1997.
- Stabilization in the mortality rate following AMI hospitalization after 1997 suggests that the Government Performance and Results Act (GPRA) goal of no more than 274 deaths per 1,000 within one year of admission may be difficult to reach.



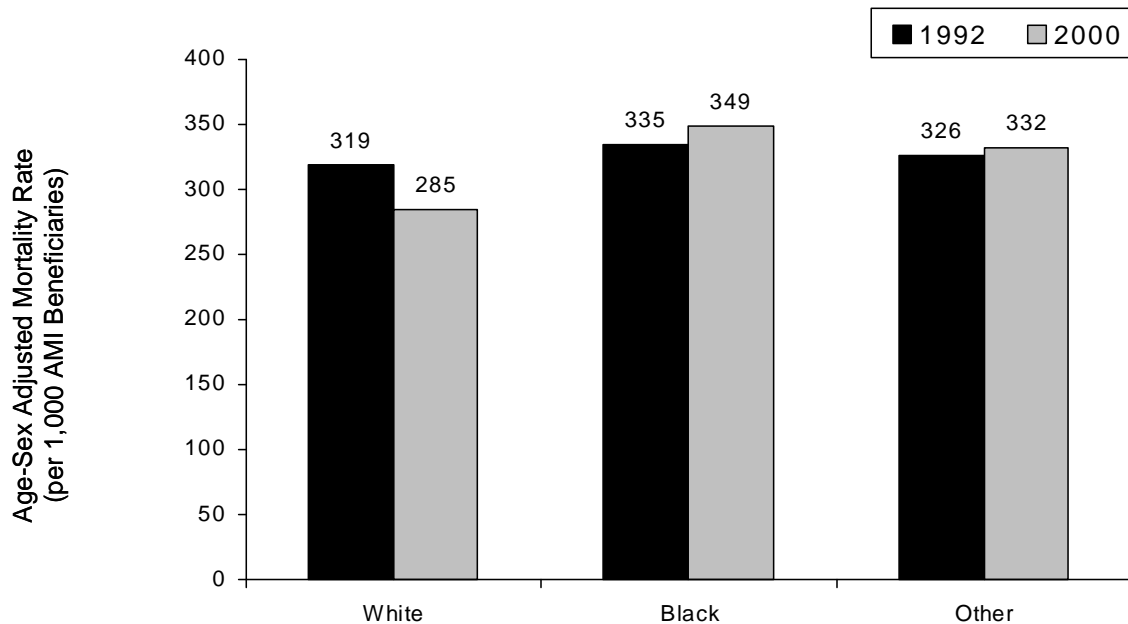
- There is pronounced state-to-state variation in the one-year AMI mortality rate (See Appendix Table B.16.). Two states exhibited one-year mortality in excess of 360 per 1,000 beneficiaries hospitalized for AMI in 2000. In the same year, four states had one-year mortality rates of less than 280 per 1,000, a discrepancy of more than 25 percent.
- There is a marked tendency for age-sex adjusted mortality to be lower in rural northern and western states and higher in southern and urban eastern states (Figure V.3).

**Table V.1. State Variation in 30-day Mortality Rates Among Beneficiaries Admitted with AMI**

	Age-Sex Adjusted 30-Day AMI Mortality Rates per 1,000 Beneficiaries Admitted for AMI		
	1992	1996	2001
Minimum	171	149	133
25 <sup>th</sup> percentile	204	181	160
Median	216	196	169
75 <sup>th</sup> percentile	233	204	178
Maximum	254	240	225

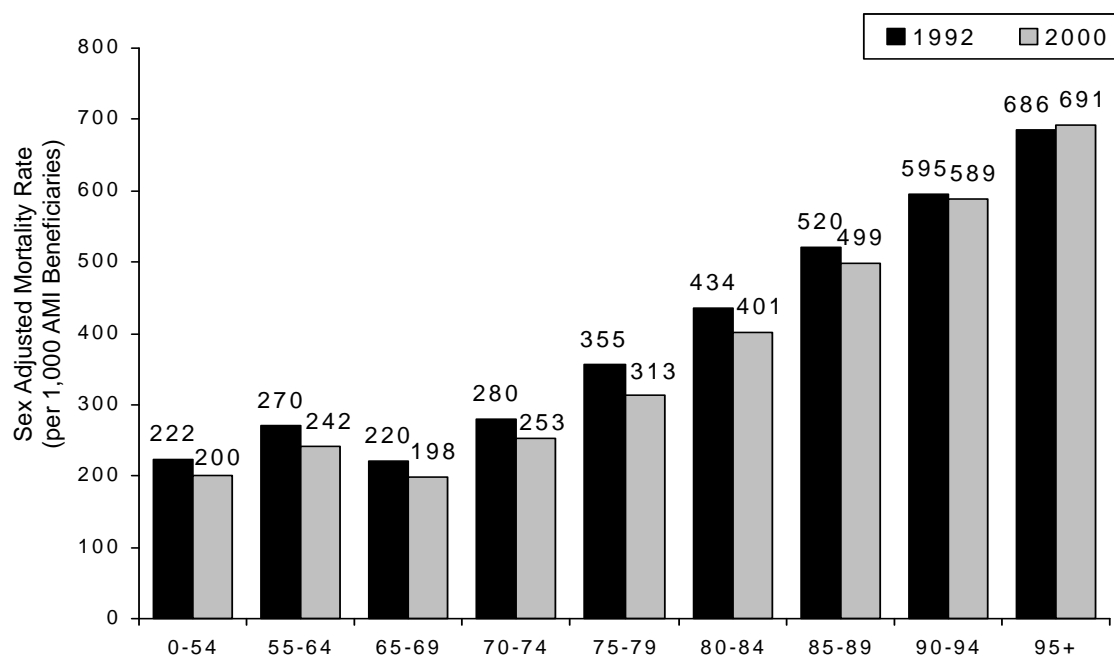
- There is clear evidence of a decline in 30-day AMI mortality as measured by state-level rates. Median mortality at the state level fell by 25 percent from 216 per 1,000 to 169 per 1,000. The minimum and maximum rates, and the 25<sup>th</sup> and 75<sup>th</sup> percentiles declined as well (Table V.1).
- The cross-state variability in AMI mortality may have increased slightly between 1992 and 2001. In 1992, the maximum AMI mortality rate was 254 per 1,000, 48 percent higher than the lowest state-level rate (171 per 1,000). By 2001, the discrepancy between maximum and minimum rates was 69 percent (133 per 1,000). However, the ratio of the 75<sup>th</sup> to the 25<sup>th</sup> percentile was about the same in 2001 as in 1992.

**Figure V.4. One-Year Mortality Rate Among Beneficiaries Admitted With AMI, by Race, 1992 and 2000**



- Reductions in AMI mortality were more pronounced for whites than for blacks. In 1992, one-year mortality rates were comparable for whites and blacks—319 per 1,000 for whites and 335 per 1,000 for blacks (Figure V.4). Between 1992 and 2000, however, mortality within one year of AMI admission fell by 11 percent for whites to 285 per 1,000 and rose by four percent for blacks to 349 per 1,000. Thus, in 2000, the one-year mortality rate for blacks was nearly 23 percent higher for than for whites.
- Similar patterns are evident in short-term mortality. As Appendix Table B.16 shows, the 30-day mortality rate was higher for whites than for blacks in 1992—191 per 1,000 for whites versus 175 per 1,000 for blacks. Though 30-day mortality declined for both blacks and whites between 1992 and 2001, white mortality fell by 24 percent and black mortality by just 10 percent. By 2001, black mortality within 30 days of AMI admission was 158 per 1,000 and white mortality was 146 per 1,000.

**Figure V.5. One-Year Mortality Rate Among Beneficiaries Admitted With AMI, by Age Group, 1992 and 2000**



- The mortality rate among aged beneficiaries increases almost linearly with age (Figure V.5). Reductions in one-year mortality were greatest among beneficiaries under the age of 80. Among beneficiaries aged 75-79, one year mortality fell by 12 percent from 355 per 1,000 in 1992 to 313 per 1,000 in 2000. For beneficiaries aged 85-89, mortality fell by 4 percent from 520 per 1,000 to 499 per 1,000.
- The generally poorer health status of the Medicare disabled population probably accounts for the greater mortality among those aged 55-64 compared with those aged 65-69.



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Anderson, R.N. and H.M. Rosenberg. "Age Standardization of Death Rates: Implementation of the Year 2000 Standard." *National Vital Statistics Reports*. vol. 47, no. 3, October 1998.

\_\_\_\_\_. "1999 Heart and Stroke Statistical Update." Dallas, TX: American Heart Association, 1998

Health Care Financing Review. *2000* Statistical Supplement.

\_\_\_\_\_. *1995* Statistical Supplement.



**APPENDIX A**

**AMI SPECIFICATIONS**

## A. AMI DISCHARGE RATES, LENGTH OF STAY, AND COST (M4)

<b>Measure</b>	Rate of AMI discharges from short-stay hospitals
<b>Case Definition</b>	<p>AMI discharges are defined as claims with a principal diagnosis code of 410 (excluding 410.x2, subsequent episodes of care)</p> <p>Claims that reflect transfers (within one day) from acute-care, short-stay hospitals to other acute-care, short-stay hospitals were combined with the claim for the original hospital admission, using the diagnosis codes from the later admission.</p>
<b>Population</b>	Beneficiaries eligible for Medicare in January of each calendar year, enrolled in Part A for the full year, and not enrolled in Medicare managed care at any point in the year. Beneficiaries who died during the calendar year but who would have otherwise qualified are included.
<b>Computation</b>	<p>Numerator:</p> <p><i>Discharge level:</i> Number of AMI discharges</p> <p><i>Beneficiary level:</i> Number of beneficiaries with at least one AMI discharge</p> <p>Denominator: Number of beneficiaries in the population</p> <p>Rates are expressed in thousands.</p>
<b>Rationale</b>	Description of AMI utilization
<b>Data Sources</b>	<p>MedPAR File</p> <p>Denominator File</p> <p>CMS Cross-Reference File</p>
<b>Exclusions</b>	<p>Missing or invalid values for state, sex, race, Medicare Status</p> <p>Discharges from all hospitals other than short-stay hospitals</p> <p>Duplicate records</p> <p>Discharges from stand-alone emergency rooms</p> <p>Discharges with invalid procedure codes</p> <p>Discharges for Medicare beneficiaries whose Health Insurance Claim Number (HICNO) does not have a match in CMS's Cross-Reference File</p> <p>Overlapping beneficiary acute-care, short-stay hospital claims</p>

<b>Adjustment</b>	<p>Rates are age/sex adjusted using the Medicare Part A FFS population as of July 1, 1999, as the standard population.</p> <p>National-level results are standardized with 18 age/sex groups using direct standardization. State-level results are standardized using indirect standardization, due to smaller sample sizes. Both methods are described in Anderson et al. (1998).</p>
<b>Period</b>	1992-2001
<b>Stratifiers</b>	<p><b>Age</b> (0-54, 55-64, 65-69, 70-74, 75-79, 80-84, 85-89, 90-94, 95+) on July 1 of the reference year.</p> <p><b>Race</b> (white, black, other)</p> <p><b>Sex</b></p> <p><b>Reason for Medicare eligibility</b> (aged without ESRD, disabled without ESRD, ESRD).</p> <p><b>Dual enrollment</b> defined as enrolled in Medicare Part A and with Medicaid buy-in at least one month during the calendar year.*</p> <p><b>Urban/rural</b> based on the metropolitan statistical area (MSA) and Bureau of Economic Analysis (BEA) State and County Crosswalk File developed for the CMS' Prospective Payment System. All counties in an MSA are designated as urban; all other counties are considered rural.</p> <p><b>Census region</b> of the beneficiary's residence on March 31 of the year following the reference year</p> <p><b>State</b> of the beneficiary's residence on March 31 of the year following the reference year</p> <p>* The Medicare data do not record true dual enrollment status but only whether a state Medicaid program pays the beneficiary's Medicare premiums, co-pays, and deductibles. The payment of these Medicare expenses by Medicaid does not always translate into full Medicaid coverage. Nevertheless, the buy-in indicator in the Medicare data is a reasonably accurate indicator of beneficiary poverty.</p>

<b>Measure</b>	Average length of stay per AMI discharge in short-stay hospitals, measured in days
<b>Case Definition</b>	<p>AMI discharges are defined as claims with a principal diagnosis code of 410 (excluding 410.x2, subsequent episodes of care)</p> <p>Claims that reflect transfers (within one day) from acute-care, short-stay hospitals to other acute-care, short-stay hospitals were combined with the claim for the original hospital admission, using the diagnosis codes from the later admission.</p>
<b>Population</b>	Beneficiaries eligible for Medicare in January of each calendar year, enrolled in Part A for the full year, and not enrolled in Medicare managed care at any point in the year, who had at least one AMI discharge. Beneficiaries who died during the calendar year but who would have otherwise qualified are included.
<b>Computation</b>	<p>Numerator: Days per AMI hospitalization, based on admission and discharge date, with a maximum of 90.</p> <p>Denominator: Number of beneficiaries in the population.</p>
<b>Rationale</b>	Description of AMI utilization
<b>Data Sources</b>	<p>MedPAR File</p> <p>Denominator File</p> <p>CMS Cross-Reference File</p>
<b>Exclusions</b>	<p>Missing or invalid values for state, sex, race, Medicare Status</p> <p>Discharges from all hospitals other than short-stay hospitals</p> <p>Duplicate records</p> <p>Discharges from stand-alone emergency rooms</p> <p>Discharges with invalid procedure codes</p> <p>Discharges for Medicare beneficiaries whose Health Insurance Claim Number (HICNO) does not have a match in CMS's Cross-Reference File</p> <p>Overlapping beneficiary acute-care, short-stay hospital claims</p>
<b>Adjustment</b>	<p>Length of stay is age/sex adjusted using the Medicare Part A FFS population as of July 1, 1999, as the standard population.</p> <p>National-level results are standardized with 18 age/sex groups using direct standardization. State-level results are standardized using indirect standardization, due to smaller</p>

	sample sizes. Both methods are described in Anderson et al. (1998).
<b>Period</b>	1992-2001
<b>Stratifiers</b>	<p><b>Age</b> (0-54, 55-64, 65-69, 70-74, 75-79, 80-84, 85-89, 90-94, 95+) on July 1 of the reference year.</p> <p><b>Race</b> (white, black, other)</p> <p><b>Sex</b></p> <p><b>Reason for Medicare eligibility</b> (aged without ESRD, disabled without ESRD, ESRD).</p> <p><b>Dual enrollment</b> defined as enrolled in Medicare Part A and with Medicaid buy-in at least one month during the calendar year.*</p> <p><b>Urban/rural</b> based on the metropolitan statistical area (MSA) and Bureau of Economic Analysis (BEA) State and County Crosswalk File developed for the CMS' Prospective Payment System. All counties in an MSA are designated as urban; all other counties are considered rural.</p> <p><b>Census region</b> of the provider state, based on the MedPAR provider ID.</p> <p><b>Census division</b> of the provider state, based on the MedPAR provider ID.</p> <p><b>State</b> of the provider state, based on the MedPAR provider ID.</p> <p>* The Medicare data do not record true dual enrollment status but only whether a state Medicaid program pays the beneficiary's Medicare premiums, co-pays, and deductibles. The payment of these Medicare expenses by Medicaid does not always translate into full Medicaid coverage. Nevertheless, the buy-in indicator in the Medicare data is a reasonably accurate indicator of beneficiary poverty.</p>

<b>Measure</b>	Medicare and Beneficiary Payments for AMI discharges
<b>Case Definition</b>	<p>AMI discharges are defined as claims with a principal diagnosis code of 410 (excluding 410.x2, subsequent episodes of care)</p> <p>Claims that reflect transfers (within one day) from acute-</p>

	care, short-stay hospitals to other acute-care, short-stay hospitals were combined with the claim for the original hospital admission, using the diagnosis codes from the later admission.
<b>Population</b>	Beneficiaries eligible for Medicare in January of each calendar year, enrolled in Part A for the full year, and not enrolled in Medicare managed care at any point in the year, who had an AMI discharge. Beneficiaries who died during the calendar year but who would have otherwise qualified are included.
<b>Computation</b>	<p>Total Medicare payments: Sum of Medicare program payments for all AMI discharges in the population</p> <p>Total Beneficiary payments: Sum of beneficiary coinsurance and deductible payments for all AMI discharges in the population</p> <p>Average Medicare Payments per Discharge:</p> <p style="padding-left: 40px;">Numerator: sum of Medicare payments for all AMI discharges in the population</p> <p style="padding-left: 40px;">Denominator: Number of AMI discharges in the population</p>
<b>Rationale</b>	Description of AMI utilization
<b>Data Sources</b>	<p>MedPAR File</p> <p>Denominator File</p> <p>CMS Cross-Reference File</p>
<b>Exclusions</b>	<p>Missing or invalid values for state, sex, race, Medicare Status</p> <p>Discharges from all hospitals other than short-stay hospitals</p> <p>Duplicate records</p> <p>Discharges from stand-alone emergency rooms</p> <p>Discharges with invalid procedure codes</p> <p>Discharges for Medicare beneficiaries whose Health Insurance Claim Number (HICNO) does not have a match in CMS's Cross-Reference File</p> <p>Overlapping beneficiary acute-care, short-stay hospital claims</p>
<b>Adjustment</b>	None
<b>Period</b>	1992-2001

<b>Stratifiers</b>	<p><b>Age</b> (0-54, 55-64, 65-69, 70-74, 75-79, 80-84, 85-89, 90-94, 95+) on July 1 of the reference year.</p> <p><b>Race</b> (white, black, other)</p> <p><b>Sex</b></p> <p><b>Reason for Medicare eligibility</b> (aged without ESRD, disabled without ESRD, ESRD).</p> <p><b>Dual enrollment</b> defined as enrolled in Medicare Part A and with Medicaid buy-in at least one month during the calendar year.*</p> <p><b>Urban/rural</b> based on the metropolitan statistical area (MSA) and Bureau of Economic Analysis (BEA) State and County Crosswalk File developed for the CMS' Prospective Payment System. All counties in an MSA are designated as urban; all other counties are considered rural.</p> <p><b>Census region</b> of the provider state, based on the MedPAR provider ID, for Medicare Payments, and of the beneficiary state, as of March 31 of the year following the reference year, for Beneficiary Payments.</p> <p><b>Census division</b> of the provider state, based on the MedPAR provider ID, for Medicare Payments, and of the beneficiary state, as of March 31 of the year following the reference year, for Beneficiary Payments.</p> <p><b>State</b> of the provider state, based on the MedPAR provider ID, for Medicare Payments, and of the beneficiary state, as of March 31 of the year following the reference year, for Beneficiary Payments.</p> <p>* The Medicare data do not record true dual enrollment status but only whether a state Medicaid program pays the beneficiary's Medicare premiums, co-pays, and deductibles. The payment of these Medicare expenses by Medicaid does not always translate into full Medicaid coverage. Nevertheless, the buy-in indicator in the Medicare data is a reasonably accurate indicator of beneficiary poverty.</p>
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<b>Measure</b>	Average number of discharges (all-cause and AMI) among beneficiaries with at least on AMI discharge
<b>Case Definition</b>	<p>AMI discharges are defined as claims with a principal diagnosis code of 410 (excluding 410.x2, subsequent episodes of care)</p> <p>Claims that reflect transfers (within one day) from acute-care, short-stay hospitals to other acute-care, short-stay</p>

	hospitals were combined with the claim for the original hospital admission, using the diagnosis codes from the later admission.
<b>Population</b>	Beneficiaries eligible for Medicare in January of each calendar year, enrolled in Part A for the full year, and not enrolled in Medicare managed care at any point in the year, who had an AMI discharge. Beneficiaries who died during the calendar year but who would have otherwise qualified are included.
<b>Computation</b>	<p>Numerator:</p> <p style="padding-left: 40px;"><i>AMI</i>: number of AMI discharges in reference year</p> <p style="padding-left: 40px;"><i>All-cause</i>: number of all discharges in reference year</p> <p>Denominator: Number of beneficiaries in the population</p>
<b>Rationale</b>	Description of AMI utilization
<b>Data Sources</b>	<p>MedPAR File</p> <p>Denominator File</p> <p>CMS Cross-Reference File</p>
<b>Exclusions</b>	<p>Missing or invalid values for state, sex, race, Medicare Status</p> <p>Discharges from all hospitals other than short-stay hospitals</p> <p>Duplicate records</p> <p>Discharges from stand-alone emergency rooms</p> <p>Discharges with invalid procedure codes</p> <p>Discharges for Medicare beneficiaries whose Health Insurance Claim Number (HICNO) does not have a match in CMS's Cross-Reference File</p> <p>Overlapping beneficiary acute-care, short-stay hospital claims</p>
<b>Adjustment</b>	None
<b>Period</b>	1992-2001
<b>Stratifiers</b>	<p><b>Age</b> (0-54, 55-64, 65-69, 70-74, 75-79, 80-84, 85-89, 90-94, 95+) on July 1 of the reference year.</p> <p><b>Race</b> (white, black, other)</p> <p><b>Sex</b></p> <p><b>Reason for Medicare eligibility</b> (aged without ESRD, disabled without ESRD, ESRD).</p> <p><b>Dual enrollment</b> defined as enrolled in Medicare Part A and</p>

	<p>with Medicaid buy-in at least one month during the calendar year.*</p> <p><b>Urban/rural</b> based on the metropolitan statistical area (MSA) and Bureau of Economic Analysis (BEA) State and County Crosswalk File developed for the CMS' Prospective Payment System. All counties in an MSA are designated as urban; all other counties are considered rural.</p> <p><b>Census region</b> of the beneficiary residence, as of March 31 of the year following the reference year.</p> <p><b>Census division</b> of the beneficiary residence, as of March 31 of the year following the reference year.</p> <p><b>State</b> of the beneficiary residence, as of March 31 of the year following the reference year.</p> <p>* The Medicare data do not record true dual enrollment status but only whether a state Medicaid program pays the beneficiary's Medicare premiums, co-pays, and deductibles. The payment of these Medicare expenses by Medicaid does not always translate into full Medicaid coverage. Nevertheless, the buy-in indicator in the Medicare data is a reasonably accurate indicator of beneficiary poverty.</p>
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**B. SPECIFICATIONS FOR READMISSION RATES (M5)**

<b>Measure</b>	Beneficiary-level and discharge-level readmission rates following AMI discharges, by type of readmission (AMI or all-cause) and by days from discharge (2, 7, 30, 180, 365, and 730)
<b>Case Definition</b>	<p>AMI discharges are defined as claims with a principal diagnosis code of 410 (excluding 410.x2, subsequent episodes of care)</p> <p>Claims that reflect transfers (within one day) from acute-care, short-stay hospitals to other acute-care, short-stay hospitals were combined with the claim for the original hospital admission, using the diagnosis codes from the later admission.</p>
<b>Population</b>	Medicare beneficiaries eligible for Medicare in January of each calendar year, and enrolled in Part A and FFS for the full calendar year, who had an AMI discharge. Beneficiaries who died during the calendar year but who would have otherwise qualified are included.
<b>Computation</b>	<p>Beneficiary-level:</p> <p>Numerator: Number of beneficiaries hospitalized for all causes/for AMI within 2, 7, 30, 180, 365, or 730 days of first AMI discharge in the reference year</p> <p>Denominator: Number of beneficiaries with at least one AMI discharge</p> <p>Discharge-level:</p> <p>Numerator: Number of beneficiaries hospitalized for all causes/for AMI within 2, 7, 30, 180, 365, or 730 days of each index AMI discharge in the reference year</p> <p>Denominator: Number of AMI discharges in the reference year.</p> <p>Rates are expressed in thousands. Rates with numerators of 25 or less are suppressed in tables.</p> <p>Beneficiary-level rates use the first AMI admission as the index admission; discharge-level rates use each AMI admission as an index admission.</p> <p>Readmissions include same-day readmissions to the same facility. Maryland readmission rates may not be comparable to those in other states. Maryland is the only state with a waiver from the CMS's prospective payment system. Due to Maryland's all-payer system, transfers may have been counted as readmissions, inflating readmission rates,</p>

	<p>especially short-term rates.</p> <p>Rates do not include beneficiaries who entered managed care or died within the window follow-up period.</p>
<b>Rationale</b>	Description of AMI outcomes
<b>Data Sources</b>	<p>MedPAR File</p> <p>Denominator File</p> <p>CMS Cross-Reference File</p>
<b>Exclusions</b>	<p>Missing or invalid values for state, sex, race, Medicare Status</p> <p>Discharges from all hospitals other than short-stay hospitals</p> <p>Duplicate records</p> <p>Discharges from stand-alone emergency rooms</p> <p>Discharges with invalid procedure codes</p> <p>Discharges for Medicare beneficiaries whose Health Insurance Claim Number (HICNO) does not have a match in CMS's Cross-Reference File</p> <p>Overlapping beneficiary acute-care, short-stay hospital claims</p>
<b>Adjustment</b>	<p>Rates are age/sex adjusted using the Medicare Part A FFS population as of July 1, 1999, as the standard population.</p> <p>National-level results are standardized with 18 age/sex groups using direct standardization. State-level results are standardized using indirect standardization, due to smaller sample sizes. Both methods are described in Anderson et al. (1998).</p>
<b>Period</b>	1992-2001
<b>Stratifiers</b>	<p><b>Age</b> (0-54, 55-64, 65-69, 70-74, 75-79, 80-84, 85-89, 90-94, 95+) on July 1 of the reference year.</p> <p><b>Race</b> (white, black, other)</p> <p><b>Sex</b></p> <p><b>Reason for Medicare eligibility</b> (aged without ESRD, disabled without ESRD, ESRD).</p> <p><b>Dual enrollment</b> defined as enrolled in Medicare Part A and with Medicaid buy-in at least one month during the calendar year.*</p> <p><b>Urban/rural</b> based on the metropolitan statistical area (MSA) and Bureau of Economic Analysis (BEA) State and County Crosswalk File developed for the CMS' Prospective</p>

	<p>Payment System. All counties in an MSA are designated as urban; all other counties are considered rural.</p> <p><b>Census region</b> of the provider state, based on the MedPAR provider ID.</p> <p><b>Census division</b> of the provider state, based on the MedPAR provider ID.</p> <p><b>State</b> of the provider state, based on the MedPAR provider ID.</p> <p>* The Medicare data do not record true dual enrollment status but only whether a state Medicaid program pays the beneficiary's Medicare premiums, co-pays, and deductibles. The payment of these Medicare expenses by Medicaid does not always translate into full Medicaid coverage. Nevertheless, the buy-in indicator in the Medicare data is a reasonably accurate indicator of beneficiary poverty.</p>
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### C. SPECIFICATIONS FOR MORTALITY RATES (M6)

<b>Measure</b>	Mortality rates among beneficiaries with an AMI hospitalization
<b>Case Definition</b>	<p>AMI hospitalizations are defined as claims with a principal diagnosis code of 410 (excluding 410.x2, subsequent episodes of care)</p> <p>Claims that reflect transfers (within one day) from acute-care, short-stay hospitals to other acute-care, short-stay hospitals were combined with the claim for the original hospital admission, using the diagnosis codes from the later admission.</p>
<b>Population</b>	<p>Medicare beneficiaries eligible for Medicare in January of each calendar year, and enrolled in Part A and FFS for the full calendar year, who had an AMI hospitalization. Beneficiaries who died during the calendar year but who would have otherwise qualified are included.</p>
<b>Computation</b>	<p>Numerator: Number of beneficiaries who died during the inpatient stay or within 2, 30, 180, 365, or 730 days from the day of the first (index) admission for AMI in the year</p> <p>Denominator: Number beneficiaries in the population</p> <p>Rates are expressed in thousands. Rates with numerators of 25 or less are suppressed in tables.</p> <p>Rate do not include beneficiaries who switched to managed care within the window follow-up period.</p>
<b>Rationale</b>	Description of AMI outcomes
<b>Data Sources</b>	<p>MedPAR File</p> <p>Denominator File</p> <p>CMS Cross-Reference File</p>
<b>Exclusions</b>	<p>Missing or invalid values for state, sex, race, Medicare Status</p> <p>Discharges from all hospitals other than short-stay hospitals</p> <p>Duplicate records</p> <p>Discharges from stand-alone emergency rooms</p> <p>Discharges with invalid procedure codes</p> <p>Discharges for Medicare beneficiaries whose Health Insurance Claim Number (HICNO) does not have a match in CMS's Cross-Reference File</p> <p>Overlapping beneficiary acute-care, short-stay hospital claims</p>

<b>Adjustment</b>	<p>Rates are age/sex adjusted using the Medicare Part A FFS population as of July 1, 1999, as the standard population.</p> <p>National-level results are standardized with 18 age/sex groups using direct standardization. State-level results are standardized using indirect standardization, due to smaller sample sizes. Both methods are described in Anderson et al. (1998).</p>
<b>Period</b>	1992-2001
<b>Stratifiers</b>	<p><b>Age</b> (0-54, 55-64, 65-69, 70-74, 75-79, 80-84, 85-89, 90-94, 95+) on July 1 of the reference year.</p> <p><b>Race</b> (white, black, other)</p> <p><b>Sex</b></p> <p><b>Reason for Medicare eligibility</b> (aged without ESRD, disabled without ESRD, ESRD).</p> <p><b>Dual enrollment</b> defined as enrolled in Medicare Part A and with Medicaid buy-in at least one month during the calendar year.*</p> <p><b>Urban/rural</b> based on the metropolitan statistical area (MSA) and Bureau of Economic Analysis (BEA) State and County Crosswalk File developed for the CMS' Prospective Payment System. All counties in an MSA are designated as urban; all other counties are considered rural.</p> <p><b>Census region</b> of the provider state, based on the MedPAR provider ID.</p> <p><b>Census division</b> of the provider state, based on the MedPAR provider ID.</p> <p><b>State</b> of the provider state, based on the MedPAR provider ID.</p> <p>* The Medicare data do not record true dual enrollment status but only whether a state Medicaid program pays the beneficiary's Medicare premiums, co-pays, and deductibles. The payment of these Medicare expenses by Medicaid does not always translate into full Medicaid coverage. Nevertheless, the buy-in indicator in the Medicare data is a reasonably accurate indicator of beneficiary poverty.</p>

